PICTURE OF THE MONTH

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[Manuscript received July 17, 1963]

The Monthly Weather Review series "Picture of the Month" is continued here as a contribution in memory of Dr. Harry Wexler. The picture (fig. 1) chosen for this issue is particularly appropriate. It displays the sort of unsolved problem that always stimulated Dr. Wexler—the problem of air-sea interaction and the endless complications of atmospheric hydrodynamics.

This TIROS V two-frame mosaic (pass 032/031, frames 24 and 26) shows the region around the Canary Islands, Madeira Islands, and a small portion of northwestern Africa. It was taken at about 1650 GMT, June 21, 1962, and read out at Wallops Station. Frame number 26 was published earlier by Hubert and Kruger [1] to illustrate small-scale eddies downstream from Madeira Island, which can be seen in the upper left. The principal area pictured here is the Canary Islands which extend across the middle of the picture, part of Africa, and the Atlantic Ocean about 150 n. mi. south of the Canaries. The clouds north of the

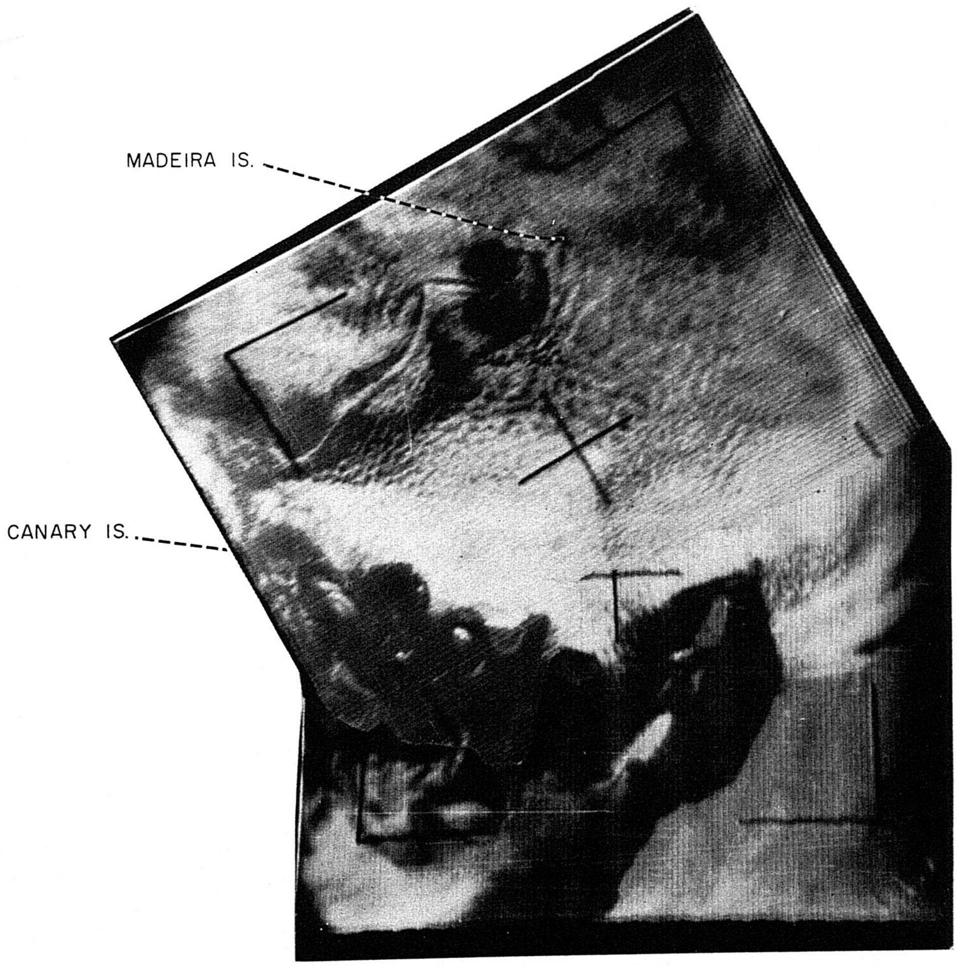

FIGURE 1.—A two-picture mosaic, frames 24 and 26 from TIROS V, pass 031/032, Camera 1, taken at 1650 GMT, June 21, 1962. North is toward the top of the picture. Stratus and stratocumulus clouds beneath a low inversion terminate along the Canary Islands chain. A smaller clear area is also produced downwind from Madeira Island.

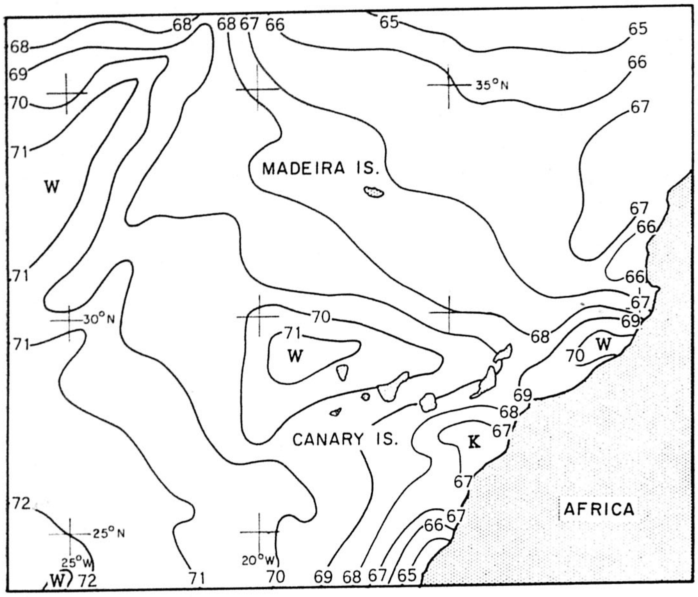

FIGURE 2.—Mean sea surface isotherms (°F.) for June in the Madeira—Canary Island region, prepared from data and analysis furnished by the Oceanographic Data Center, Washington, D.C.

Canary Islands are stratus and stratocumulus. Their marked discontinuity at the islands reflects a strong thermal and/or dynamic mechanism because north to northeast winds were blowing across the cloud edge.

Climatologically, this region is one of relatively cool water and low-lying stratocumulus clouds topped by a pronounced temperature inversion. On this particular day, the 1200 GMT sounding at Funchal, Madeira, and the 0000 GMT sounding at St. Cruztenri, Canary Islands, both revealed an inversion of 3°C. near the 950-mb. level. No detailed synoptic oceanographic data are available but mean monthly temperatures reveal some interesting aspects.

Figure 2 shows the mean sea surface temperatures for June, prepared from data and analysis provided by the staff of the National Oceanographic Data Center, Washington, D.C. The pronounced warm center just northwest of the Canaries tempts one to hypothesize cloud generation due to heating from the sea surface when northerly flow moves the air toward warmer water, and clearing when the gradient is reversed. This model has some difficulties however.

First, the lack of heating from below or even the commencement of cooling seems inadequate to account for the very abrupt cloud evaporation observed in figure 1, in view of the northerly winds which should advect the cloud deck over cool water.

Second, this effect, in various degrees of development, is frequently seen downstream from islands in this type of meteorological situation, during months when the mean sea surface isotherms show no reversal of gradient.

Against this objection one could argue that daily isotherms may be quite different from monthly mean isotherms. It is therefore possible that the gradient does reverse when the abrupt clearing occurs.

Clearing sometimes can be seen both downwind and upwind from islands in regions where there is frequently a low and strong inversion. Notice for example, the clear area around Madeira Island in figure 1. This suggests a strong obstacle effect of the islands upon airflow and upon the inversion height, which may be independent of ocean surface heating or cooling.

Much of the island terrain extends above the inversion so that air must be deflected mostly in the horizontal rather than vertically when the wind flows across the region. It is suggested that under proper circumstances, a standing wave in the inversion interface might be produced in such a way that its trough occurs just south of the islands. The convective condensation level of the moist air beneath the inversion at both Madeira and the Canary Islands is just at the inversion base. Therefore if the inversion sloped downward sharply downstream, clouds would be dissipated as the winds carried them to lower levels.

The clear area extends some 100 mi. south of the islands however. Some mechanism must be invoked to account for this broad cloudless area. A standing wave in the inversion with its crest *beyond* the clear region seems too long. Perhaps cooler ocean waters south of the islands are a factor tending to suppress cloud reformation.

Whatever the complete explanation, it seems very likely that the presence of the islands is critical. They represent significant obstacles to both the oceanic and atmospheric flow, thereby deforming the temperature structure of both media. The terrain itself may comprise a heat source for the atmosphere in a manner that would help maintain the sharp cloud edge.

Everyone who knew Dr. Wexler can appreciate how this problem would have whetted the appetite of his inquiring mind. I would like to point out that, in a way, he has bequeathed this fascinating puzzle to us, because we have been able to recognize it and to define its extent only with the meteorological satellite, an advancement so vigorously sponsored by him.

REFERENCE

1. L. F. Hubert and A. F. Krueger, "Satellite Pictures of Mesoscale Eddies," *Monthly Weather Review*, vol. 90, No. 11, Nov. 1962, pp. 457–463.